Claims

[c1] 1.A method for producing transformed sunflower cotyledons comprising:
obtaining a cotyledon from a germinated sunflower seedling;
contacting the cotyledon with a culture of *Agrobacterium* ;
culturing the *Agrobacterium*-contacted cotyledon in a first media to produce transformed cotyledon tissue, wherein the first media has a high osmotic pressure;
inducing shoot growth from the transformed cotyledon tissue in a second media, wherein the second media has a low osmotic pressure; and
selecting the transformed cotyledon tissue thus produced.

[c2] 2.The method of claim 1, wherein the high osmotic pressure of the first media is between about 200 mOsm and about 750 mOsm.

[c3] 3.The method of claim 1, wherein the first media contains a carbohydrate.

[c4] 4.The method of claim 3, wherein the carbohydrate is glucose, sucrose, mannitol, fructose, maltose, mannose, or xylose.

[c5] 5.The method of claim 4, wherein the concentration of the carbohydrate in the first media is from about 5% (w/v) to about 30% (w/v).

[c6] 6.The method of claim 1, wherein the first media contains 6-benzylaminopurine.

[c7] 7.The method of claim 1, wherein the cotyledon is processed along the axis between the root and shoot prior to contacting the cotyledon with the culture of *Agrobacterium* .

[c8] 8.The method of claim 1, wherein the cotyledon is incubated at a temperature between about 0 ° C and about 10 ° C prior to contacting the cotyledon with the culture of *Agrobacterium* .

[c9] 9.The method of claim 1, wherein the cotyledon is contacted with the culture of *Agrobacterium* in an infiltration media comprising one or more cytokinins and one or more carbohydrates.

[c10] 10.The method of claim 9, wherein the carbohydrate in the infiltration media is sucrose.

[c11] 11.The method of claim 9, wherein the concentration of the carbohydrate in the infiltration media is less than about 5% (w/v).

[c12] 12.The method of claim 9, wherein the cytokinin in the infiltration media is 6-benzylaminopurine.

[c13] 13.The method of claim 9, wherein the concentration of the cytokinin in the infiltration media is less than about 0.5 μ g/mL.

[c14] 14.The method of claim 1, wherein the transformed cotyledon tissue is further incubated in at least one selection media containing a selection agent.

[c15] 15.The method of claim 14, wherein the selection media comprises glyphosate, paromomycin, G418, or kanamycin.

[c16] 16.The method of claim 15, wherein the concentration of the glyphosate in the selection media is from about 0 mM to about 0.5 mM.

[c17] 17.The method of claim 14, wherein the transformed cotyledon tissue is sequentially transferred into a first, second, and third selection media.

[c18] 18.The method of claim 17, wherein the first selection media comprises from about 0 mM to about 0.06 mM glyphosate, the second selection media comprises from about 0.075 mM to about 0.25 mM glyphosate, and the third selection media comprises from about 0 mM to about 0.06 mM glyphosate.

[c19] 19.The method of claim 1, further comprising the step of culturing the transformed cotyledon tissue to produce transgenic shoots.

[c20] 20.The method of claim 19, further comprising the step of culturing the transgenic shoots to produce a transgenic sunflower plant.

[c21] 21.The method of claim 20, further comprising the step of growing the transgenic sunflower plant to produce transgenic sunflower seeds.

[c22] 22.The method of claim 1, wherein the *Agrobacterium* comprises a recombinant

nucleic acid vector comprising operatively linked in the 5" to 3" direction:
a promoter that functions in a sunflower cell to direct transcription of a structural nucleic acid sequence;
a structural nucleic acid sequence;
a 3" transcriptional termination signal; and
a 3" polyadenylation signal.

[c23] 23.The method of claim 22, wherein the nucleic acid vector further comprises a selectable marker.

[c24] 24.The method of claim 23, wherein the selectable marker is a kanamycin resistance marker, a hygromycin resistance marker, or a herbicide resistance marker.

[c25] 25.The method of claim 22, wherein the promoter is seed selective, tissue selective, constitutive, or inducible.

[c26] 26.The method of claim 22, wherein the promoter is the nopaline synthase (NOS), octopine synthase (OCS), mannopine synthase (mas), cauliflower mosaic virus 19S and 35S (CaMV19S, CaMV35S), enhanced CaMV (eCaMV), ribulose 1,5-bisphosphate carboxylase (ssRUBISCO), figwort mosaic virus (FMV), CaMV derived AS4, tobacco RB7, wheat POX1, tobacco EIF-4, lectin protein (Le1), or rice RC2 promoter.

[c27] 27.The method of claim 22, wherein the structural nucleic acid sequence is a synthetic, plant, fungal, or bacterial structural nucleic acid sequence.

[c28] 28.A method for producing a transformed sunflower plant comprising:
obtaining a cotyledon from a germinated sunflower seedling;
contacting the cotyledon with a culture of *Agrobacterium* ;
culturing the *Agrobacterium*- contacted cotyledon in a first media to produce transformed cotyledon tissue, wherein the first media has a high osmotic pressure;
inducing shoot growth from the transformed cotyledon tissue in a second media, wherein the second media has a low osmotic pressure;
selecting the transformed cotyledon tissue thus produced; andproducing a

transformed sunflower plant from the transformed cotyledon tissue.

[c29] 29.A method for producing transformed sunflower seeds comprising:
obtaining a cotyledon from a germinated sunflower seedling;
contacting the cotyledon with a culture of *Agrobacterium* ;
culturing the *Agrobacterium*- contacted cotyledon in a first media to produce transformed cotyledon tissue, wherein the first media has a high osmotic pressure;
inducing shoot growth from the transformed cotyledon tissue in a second media, wherein the second media has a low osmotic pressure;
selecting the transformed cotyledon tissue thus produced;
producing a transformed sunflower plant from the transformed cotyledon tissue; and
growing the transformed sunflower plant in a manner allowing for the setting of transformed sunflower seed.